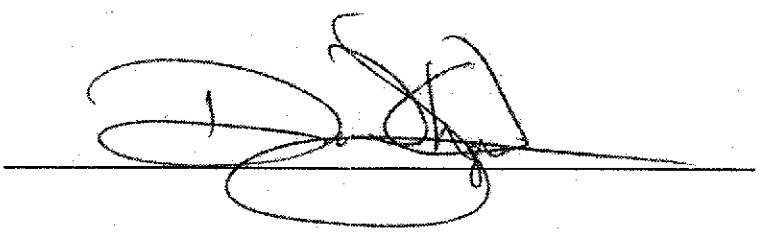
In the United States District Court
for the District of Idaho

United States of America
V.
ASARCO Incorporated *et al.*

No. CV96-0122-N-EJL

Supplemental Expert Report of:

David Chapman



November 9, 2004

1. Introduction

This report supplements Chapman and Falter (2004). In this supplemental report I describe ongoing data collection and preliminary analysis to refine the estimates of the quantity of submerged timber in the portion of Coeur d'Alene Lake for which the Coeur d'Alene Tribe is a trustee as presented in Chapman and Falter (2004). The additional information that I have reviewed is data collected by Avista Corporation during their bathymetric survey of Coeur d'Alene Lake for the Post Falls relicensing effort. My analysis is ongoing. If additional information becomes available, I may supplement my opinions to reflect such information.

2. Information Relied On

In developing my opinions, I have relied on all of the information previously identified in Chapman and Falter (2004) and on additional information collected after that report. This additional information includes side-scan sonar and multibeam sonar bathymetric data collected by Avista Corporation for use in the Post Falls Dam Re-licensing Project and which was recently provided to the Coeur d'Alene Tribe; underwater photographs of submerged timber taken by Jeff Jordan and Jason Brown of the Coeur d'Alene Tribe Lake Management Department; and GIS analysis of the Avista Corporation conducted by Stratus Consulting staff.

3. Qualifications

I am an environmental economist at Stratus Consulting in Boulder, Colorado. My qualifications and resume were previously presented in expert reports prepared in August 2004 on natural resource damages to aquatic resources and federal lands, and in a summary of damages to injured trust resources.

4. Compensation

I am an employee of Stratus Consulting Inc. Stratus Consulting has been compensated at the time and materials hourly rate of $160 for my time. Total compensation received by Stratus Consulting for the preparation of this addendum to my expert report is approximately $6,000.

5. Purpose of Additional Investigation

I investigated these additional data for two reasons. The first is to determine whether or not the bathymetric survey data can be used to identify submerged timber within the study area. The second, based on the ability to identify submerged timber, would be to use these additional data to refine the estimates presented in Chapman and Falter (2004) of the total quantity of submerged timber in the tribal portion of Coeur d'Alene Lake.

6. Study Area

The overall study area for this analysis is the same area considered in Chapman and Falter (2004), the southern portion of Lake Coeur d'Alene. The newly acquired bathymetric data cover the southern portion of the lake. At this time, the specific area that I investigated further is the southern shoreline of the tribal portions of the lake. This area includes Cleland and Brown's Bays. This area is presented in Figure 1.

7. Bathymetric Survey Data

Avista Corporation conducted a bathymetric survey in portions of Coeur d'Alene Lake as part of the Post Falls Dam Re-licensing Project study. See Attachment 1 for the final study plan for this study. Two types of sonar data were collected: side scan and multibeam.

The raw sidescan sonar data were collected in June 2003, and processed by Parametrix, Inc., for Avista Corporation using ISIS side-scan sonar acquisition and processing software. Avista provided the Coeur d'Alene Tribe with georeferenced TIF images of the shoreline sonograms around the southern lakeshore. These initial data provided to the Tribe were georeferenced TIFF images of the processed data with a resolution of about 0.2 meters (0.656 feet). I also obtained samples of the raw sonar data generated during the bathymetric survey. The raw sonar data produce images at a finer resolution (~ 0.1 meter) than the processed data used to generate the georeferenced TIFF images. I am in the process of obtaining the full set of raw sonar data for the study area and thus, at this time I have not had the opportunity to process and evaluate the full set of raw sonar data to complete my investigation. Images of the raw sonar data are presented in Attachment 2.

8. Activities To Date

The georeferenced tiff images were imported into Stratus Consulting's base GIS project for Coeur d'Alene Lake. I reviewed the TIFF images and GIS project to determine whether or not one could identify areas of submerged timber in Brown's and Cleland Bays and other portions of Coeur d'Alene Lake. The georeferenced images reveal a significant number of echo images that were identified as "woody debris" by Avista's contractor Parametrix (e-mail communication Richard McGee, October 4, 2004). Attachment 3 discusses analysis of Parametrix woody debris classification. Figures 2 and 3 show a sample of these images.

Before the bathymetric data were used to evaluate the quantity of submerged timber within the Tribal portions of Coeur d'Alene Lake, it was necessary to determine whether or not the identified images were in fact submerged timber. To determine if these echo images which are identified as woody debris are in fact submerged timber we selected a number of sites to "ground truth" the sonar echo images via visual inspection and underwater photography.

9. Ground Truthing of Bathymetric Survey Data

To undertake this verification, seven sample locations were chosen for underwater photography of the items identified on the bathymetric data as submerged timber.[1] These seven samples site are as follows:

Id	Location	East_UTM83	North_UTM83
1	Brown's Bay	517178.16560100000	5251612.23873000000
2	Just south of Conkling Park	518290.96951199900	5249277.35895999000
3	Brown's Bay	517414.11125100000	5251211.62700999000
4	Brown's Bay	517531.57186099900	5251279.67136000000
5	Cleland Bay	515129.12162699900	5253881.56611000000
6	Cleland Bay	515005.41508300000	5253976.45005999000
7	Fullers Bay	515690.07681200000	5253530.18209999000

1. Seven locations were selected because it was believed that seven sites could be investigated via scuba diving and underwater photography in a single day.

Figures 4-8 show these sample sites on the sonar data images. The actual sample site is identified with a yellow circle.

On October, 19, 2004, Jeff Jordan (Coeur d'Alene Tribe Department of Fisheries) and Jason Brown (Coeur d'Alene Tribe Department of Wildlife) inspected five of the seven identified locations. Two locations, Site ID 4 and Site ID 7, were not inspected due to lack of air supply for diving. At each of the five sites inspected, multiple large logs were observed (personal communication, Jeff Jordan and Jason Brown, October 25, 2004, and e-mail communication, October 25, 2004, Attachment 3). Photographs of submerged timber were taken at each of the five locations. Figures 9-14 are photographs taken at the inspected sites.[2] At each of the inspected sites, the sonogram images were confirmed to be submerged timber.

10. Findings To Date

The review of the bathymetric data supports the findings that significant quantities of submerged timber exist in the southern portion of Coeur d'Alene Lake. The 0.2 meter resolution sonar data can provide guidance on the exact location of this submerged timber in the lake. Ground truthing of the sonar images by physical inspection supports the conclusion that sonar images can be identified as submerged timber. Inspection of the raw sonar data indicated that these data will be able to be used to help quantify the amount of submerged timber in the southern portion of Coeur d'Alene Lake and to refine the overall estimates of damages presented in Chapman and Falter (2004). My investigation into the quantification of submerged timber is ongoing at this time. If additional relevant information becomes known to me, I reserve the right to supplement this analysis to help further refine the calculations presented in this report and Chapman and Falter (2004).

2. Refracted light from flash created low visibility and green hue in photographs.

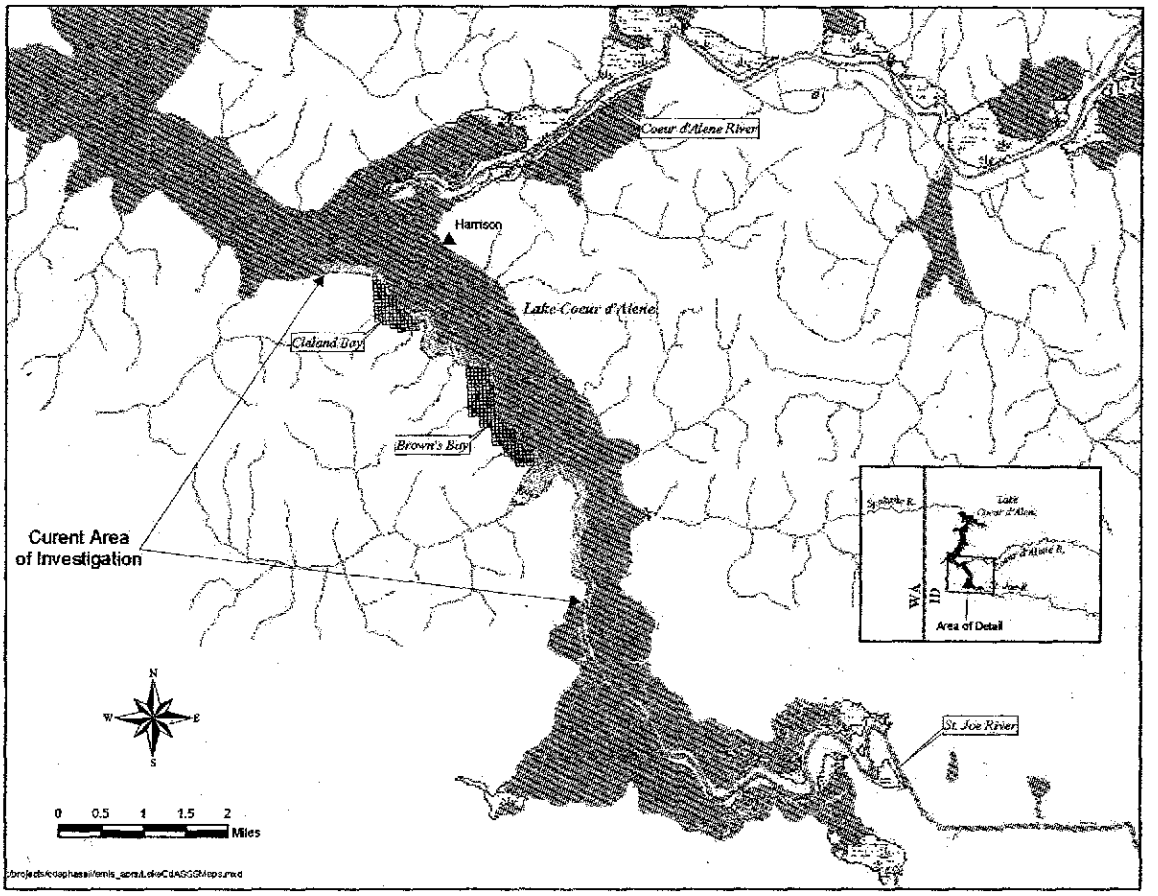


Figure 1. Current area of investigation.

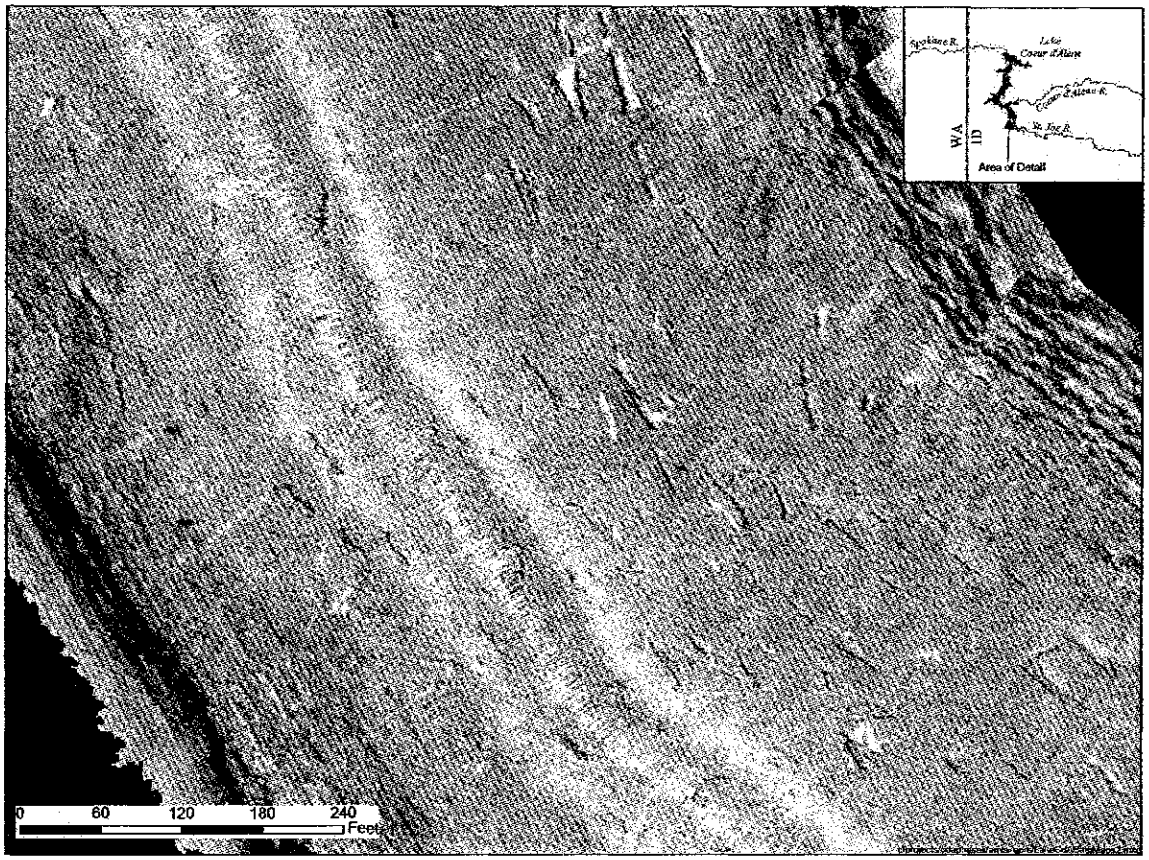


Figure 2. Side-scan sonar graph of Brown's Bay showing the dense concentration of logs on the lake bed.

Source: Avista Corporation side-scan sonar survey data.

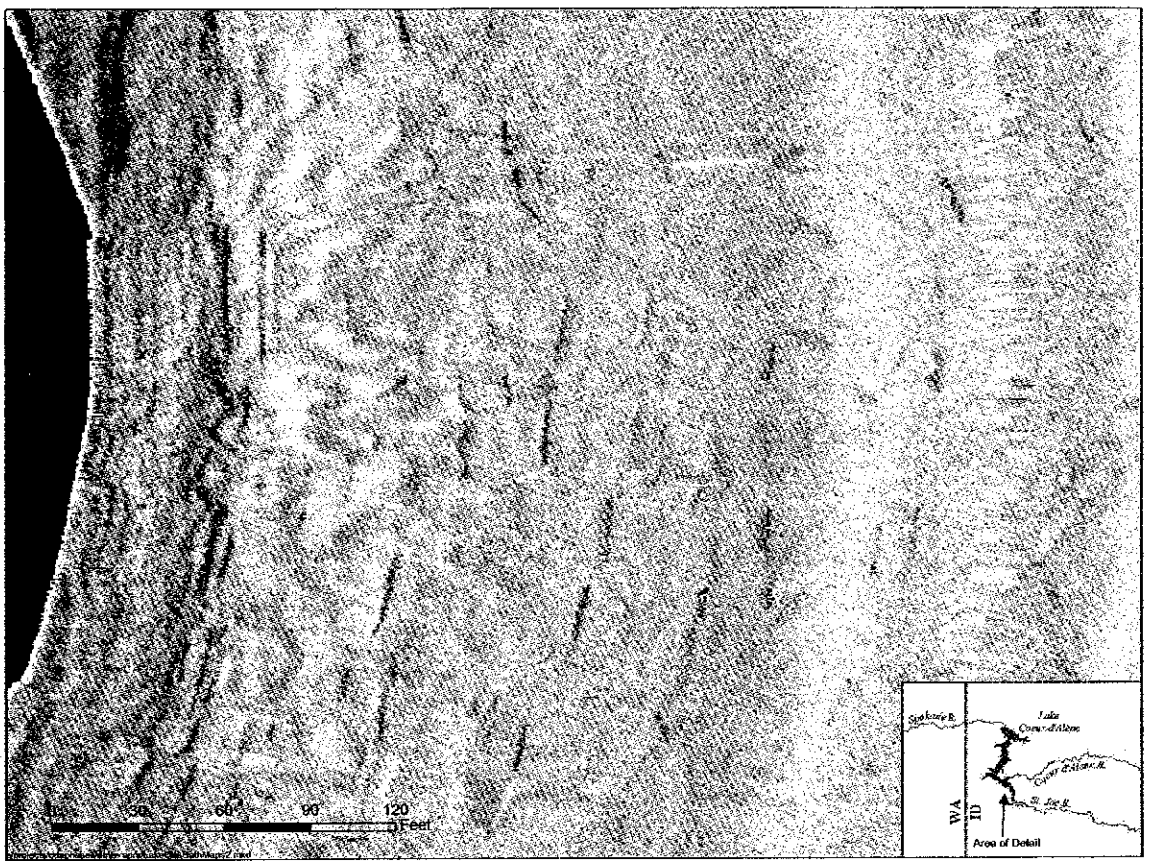


Figure 3. Side-scan sonar graph of Cleland Bay showing the dense concentration of logs on the lake bed.

Source: Avista Corporation side-scan sonar survey data.

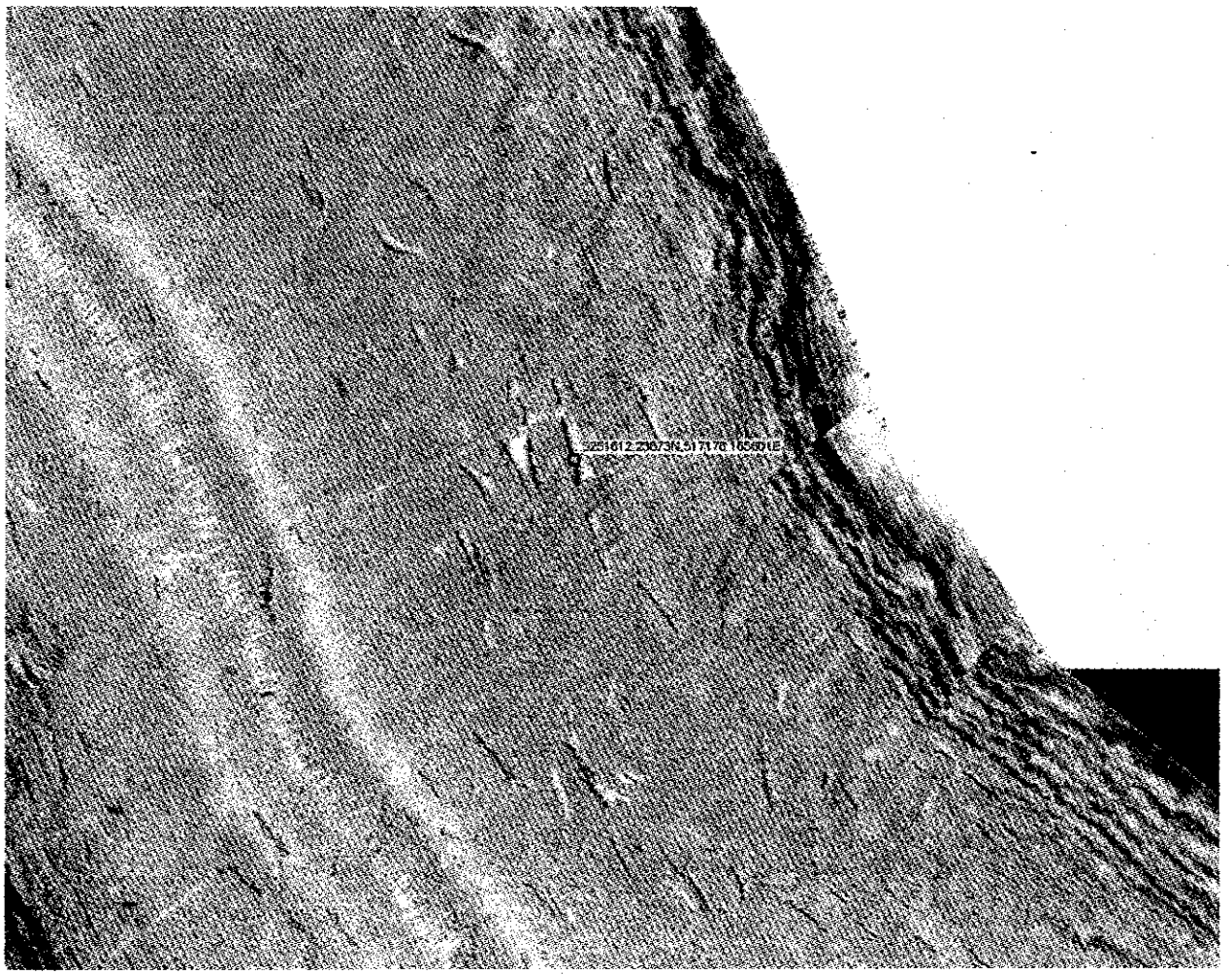


Figure 4. Brown's Bay photo sample — Site ID 1.

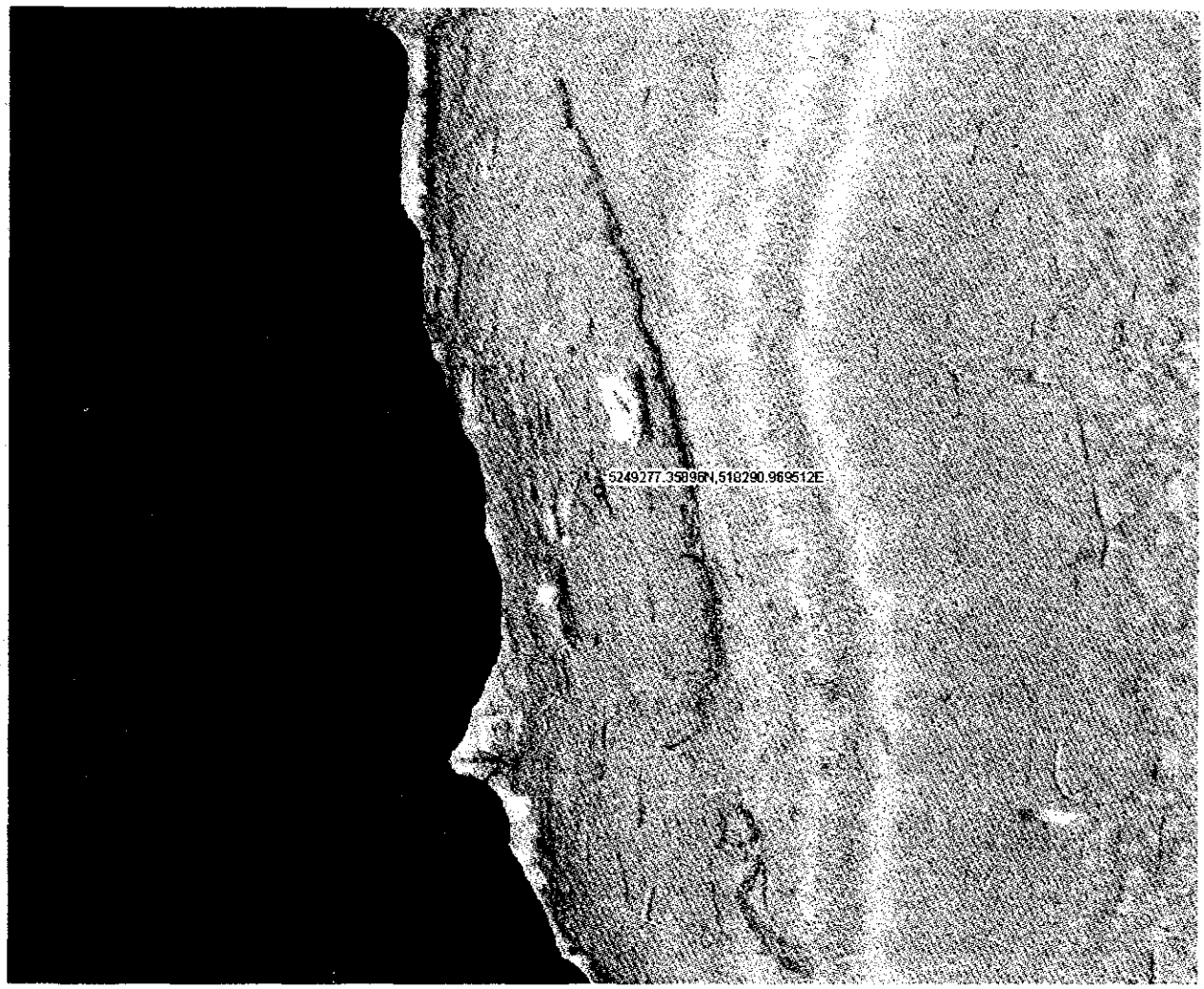


Figure 5. South of Conkling Park photo sample — Site ID 2.

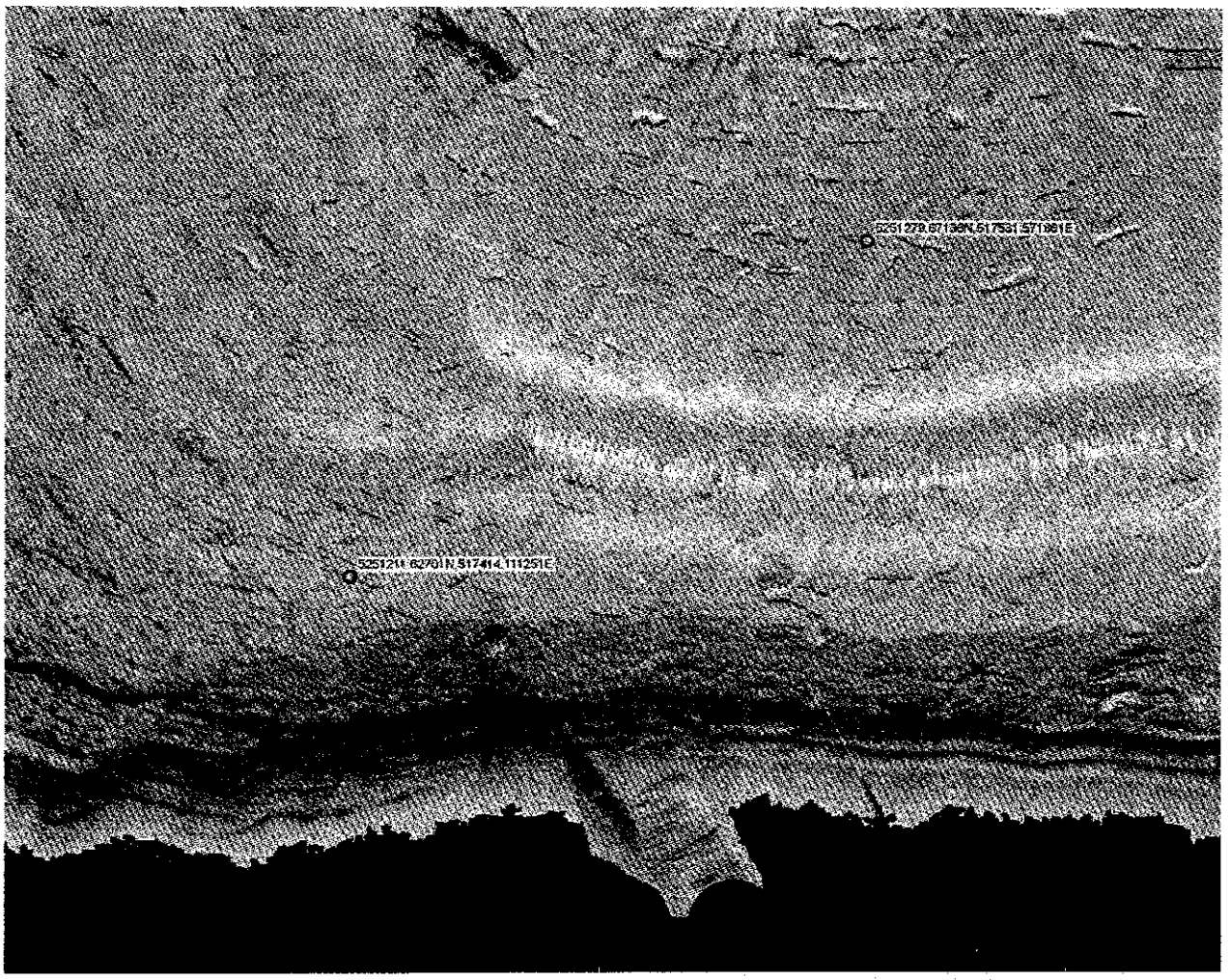


Figure 6. Brown's Bay photo sample — Sites ID 3 and 4.

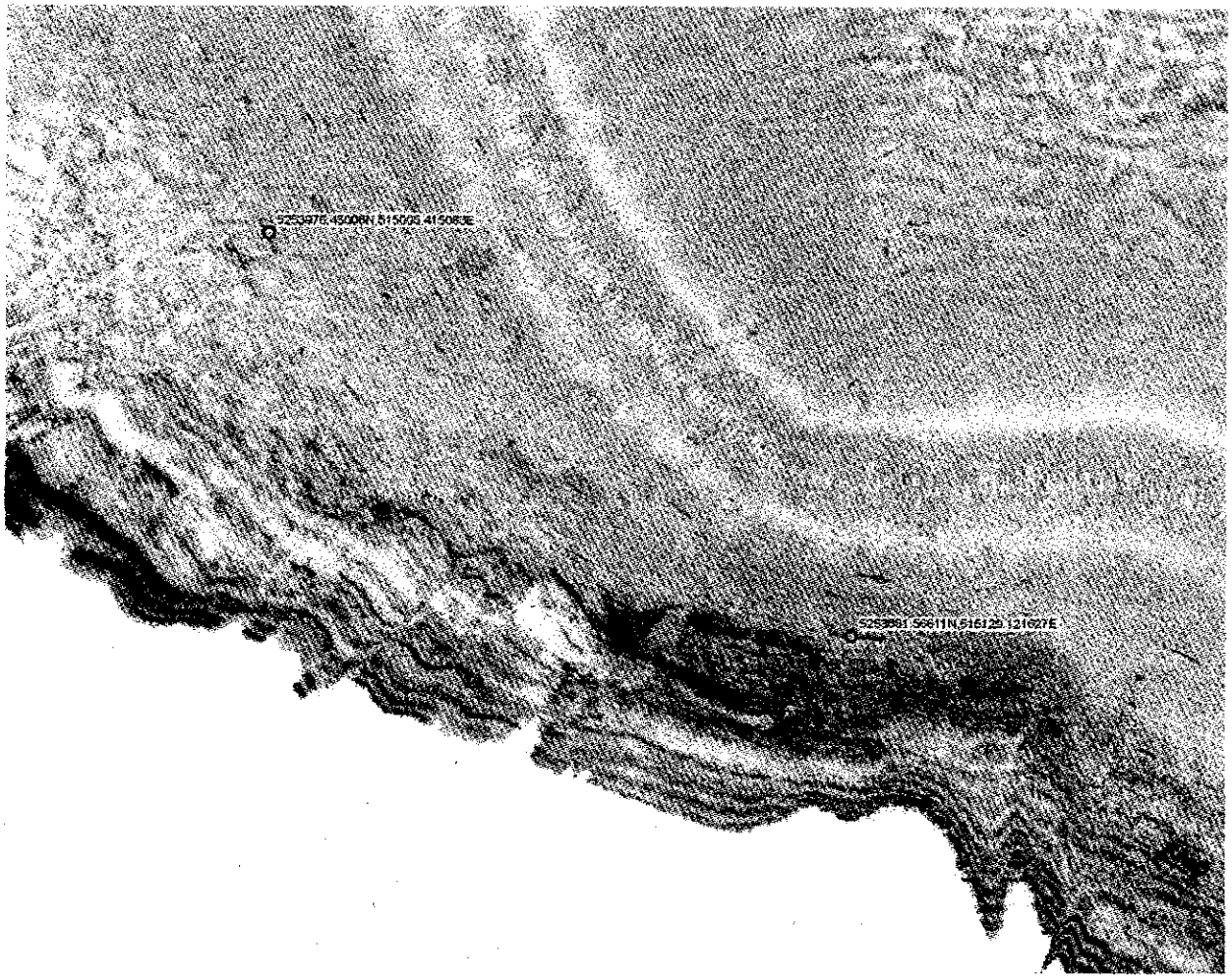


Figure 7. Cleland Bay photo sample – Sites ID 5 and 6.

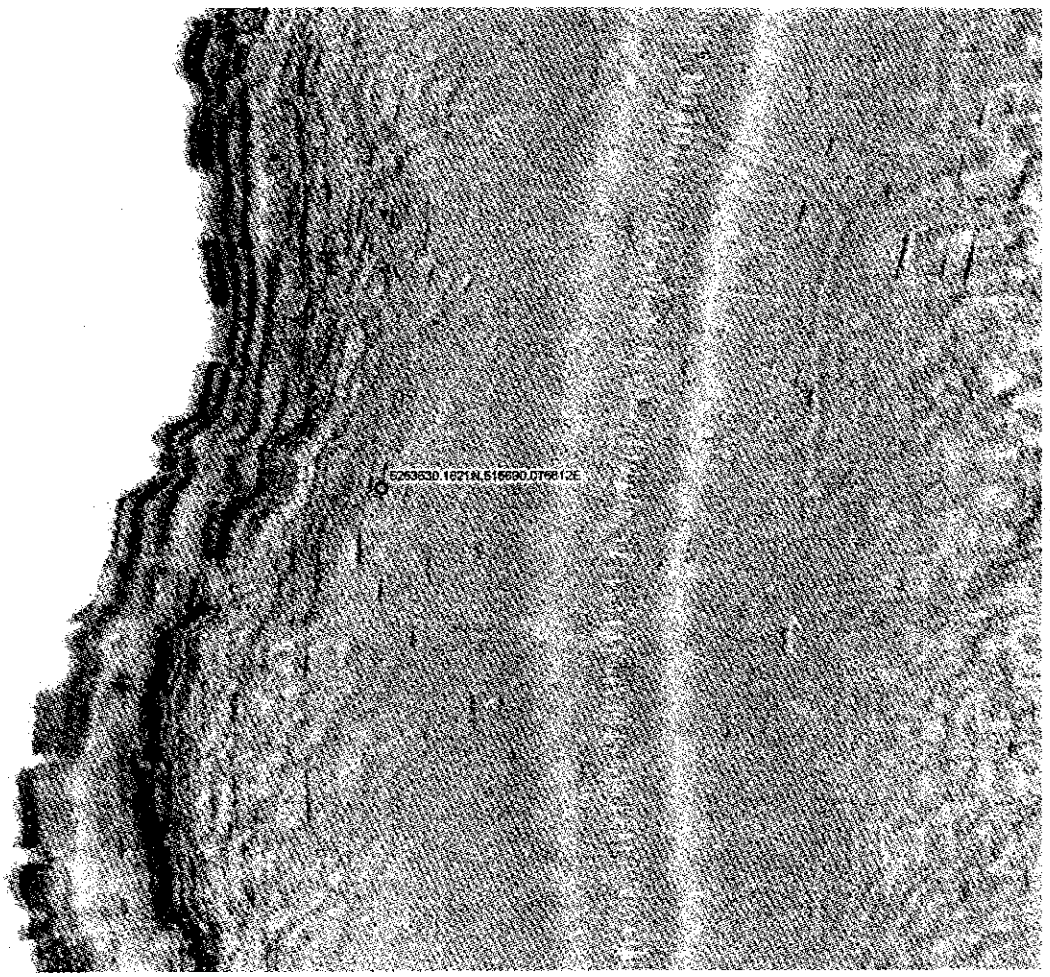


Figure 8. Fullers Bay photo sample – Site ID 7.

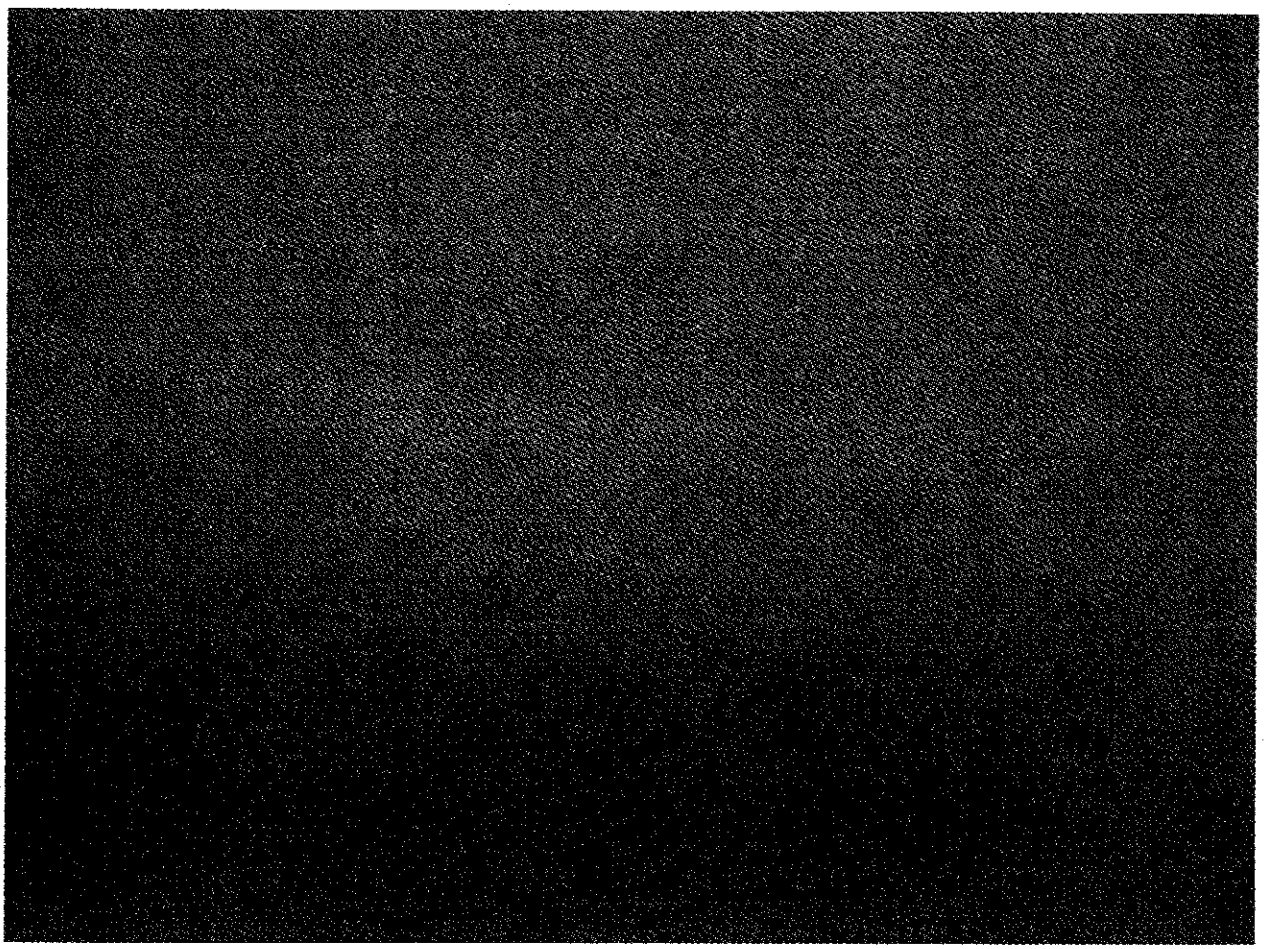


Figure 9. Photograph of submerged log at Site ID 2.

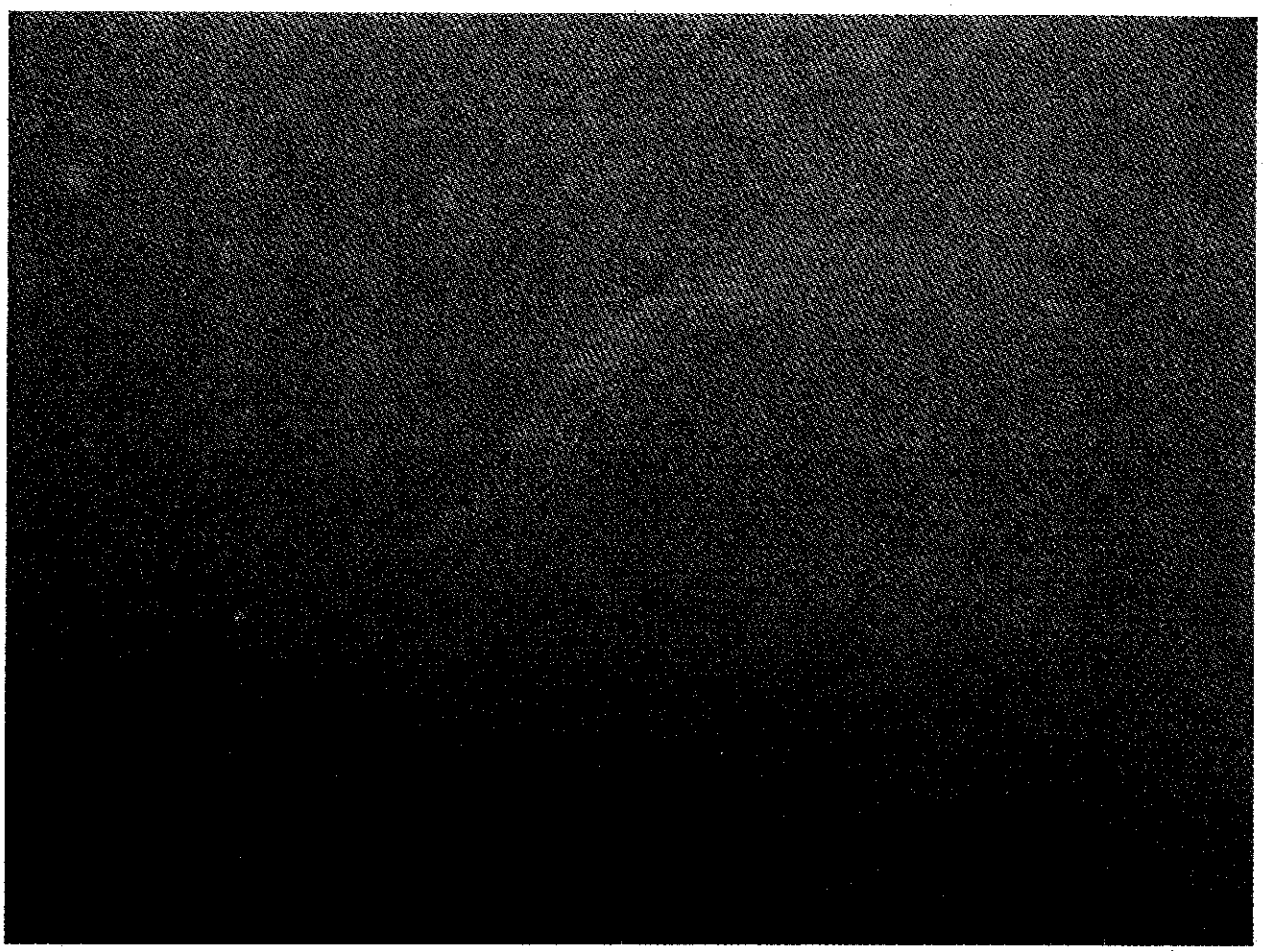


Figure 10. Photograph of submerged log at Site ID 3.

Figure 11. Photograph of submerged log at Site ID 5.

Figure 12. Photograph of submerged log at Site ID 6.

Figure 13. Photograph of submerged log at Site ID 5.

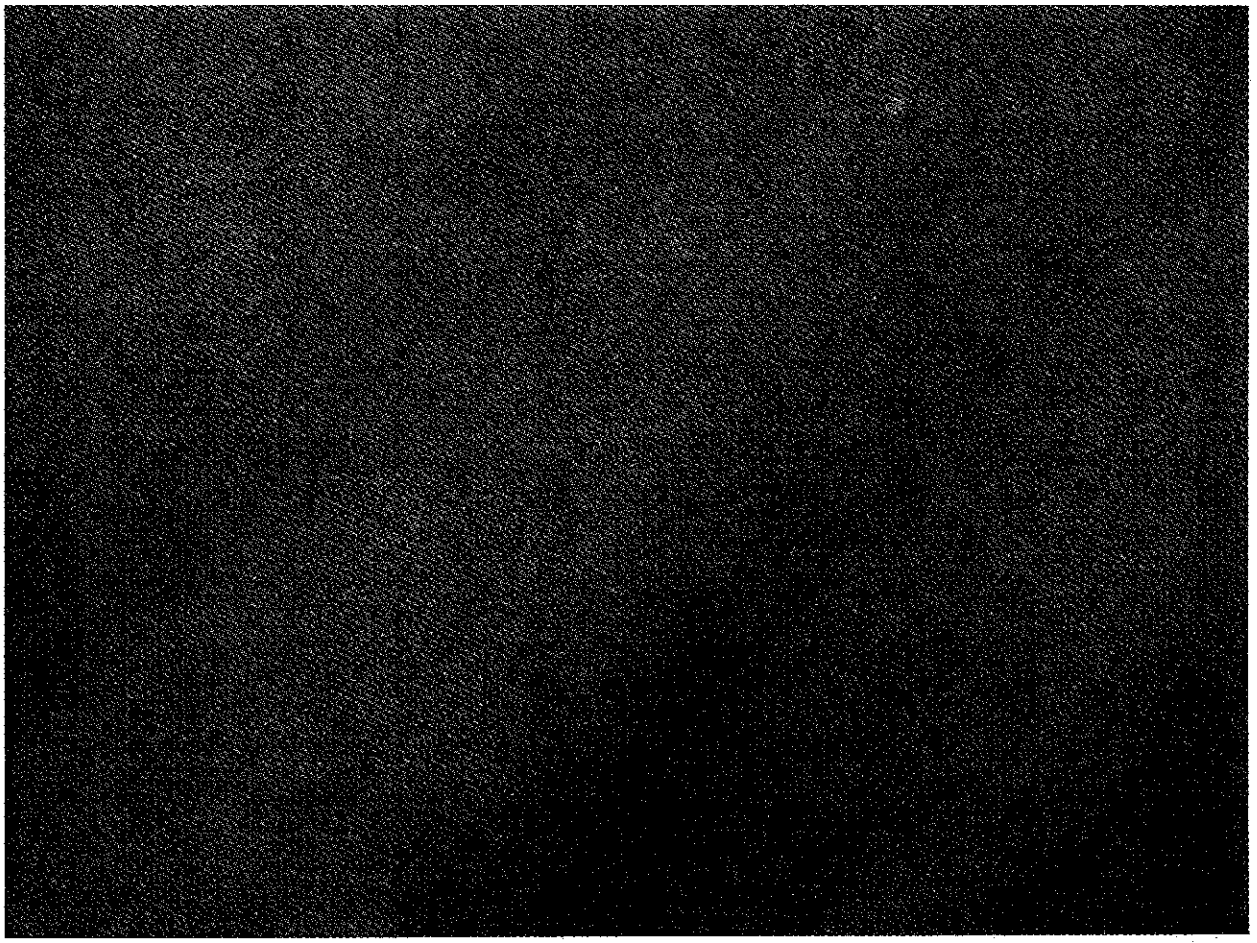


Figure 14. Photograph of submerged logs at Site ID 5.

Attachment 1. Avista Corporation Bathymetric Study Plan

Final Study Plan

Bathymetry of Lake Coeur d'Alene and Tributaries

Spokane River Hydroelectric Project

FERC Project No. 2545, Avista Corporation

Work Group
Fisheries Technical Work Group

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Purpose

- Identify and map the shallow water bathymetry of Lake Coeur d'Alene and inundated portions of the Coeur d'Alene and St. Joe river channels to provide physical information for description of fish habitat.
- Develop bathymetry data appropriate for support of computational modeling of temperature of Lake Coeur d'Alene.

Objectives

1. Conduct bathymetry survey of shallow water habitat using multibeam hydroacoustic technique, including side-scan sonar data to identify substrate texture characteristics.
2. Identify and map substrate characteristics of shallow water habitat (< 30 ft deep).
3. Survey deeper (-30 ft) portions of Coeur d'Alene Lake and Spokane River to Post Falls Dam forebay using the multibeam hydroacoustic technique.

Methods

Bathymetric data will be obtained by a multibeam bathymetric survey to obtain information over a wide swath (~7x depth) of the lake bottom with each pass through an area. Data will be gathered with a Simrad EM3000 sonar system (150° swath width, <1° beam width, 300 kHz frequency). Digital GIS information on data position will be obtained simultaneously. Substrate texture information will also be gathered simultaneously by the Simrad EM3000 system. The Simrad EM3000 will be deployed on a sufficiently large vessel to provide stability in moderate weather conditions. This multibeam system will be "patch-tested' prior to surveys to ensure vertical and horizontal accuracies are within survey specifications. Vertical accuracy will be within ±7 inches (15 cm) at the outer beams and approximately ±2.5 inches at nadir. Single beam hydrographic data will be collected concurrently to verify accuracy of the multibeam soundings.

Motion and attitude of the survey vessel will be measured and recorded using a TSS-MAHRS or equivalent equipment.

Data location will be determined by Differential GPS. Horizontal accuracy will be approximately 2-3.5 ft using the nearest available USCG beacons. If USGS DGPS correction beacons are not available in the proximity of the survey area, the most accurate of WAAS or Omnistar Worldwide DGPS Service will be used. Surveys will be conducted in accordance with U.S. Army Corps of Engineers Class 1 guidelines as described in USACE EM 1110-2-1003, Hydrographic Survey Manual (USACE 1994).

Bathymetry data will be gathered during a two-week period when lake surface elevation is >= to 2,128. Survey of the southern end of the lake and the two major rivers will be adjusted during this time to take advantage of the highest predictable lake elevation.

Data processing of multibeam data will be conducted using the Caris Hydrographic Processing GIS system together with the Triton Elics BathyPro survey data processing software. Data editing will delete erroneous or poor quality data points and correct for lake surface elevation changes during the survey. Data will be stored in Triton's XTF data format of post-processing, analysis and archiving.

A Digital Terrain Model (DTM) will be used to produce contours. Sidescan data will be mosaicked using TEI's ISIS Sonar processing package in conjunction with ERMapper spatial mapping software

Results/Nature of Results

1. Data files providing detailed depth information for the entire lake and inundated portions of the major tributaries. All data will be reported as XYZ (horizontal: NAD 83/91, feet ; vertical Datum: NAVD 88, feet) with elevation reported in an agreed datum.
2. ASCII files of all XYZ data.
3. Plan view maps at an agreed scale of shallow water bathymetry using 2 ft depth contour intervals to a depth of ~30 ft. Survey data will not include depths of less than 3 ft during the time the survey data is collected.
4. Maps of deeper water areas of Lake Coeur d'Alene using either 5 or 10 ft contour intervals as appropriate.

How Results May Be Used In Relicensing Decisions

The results of these investigations will be used in several different manners to support relicensing decisions. These include characterization of fish habitat and how it changes with varying lake surface elevations, and modeling of the hydraulic characteristics of Lake Coeur d'Alene.

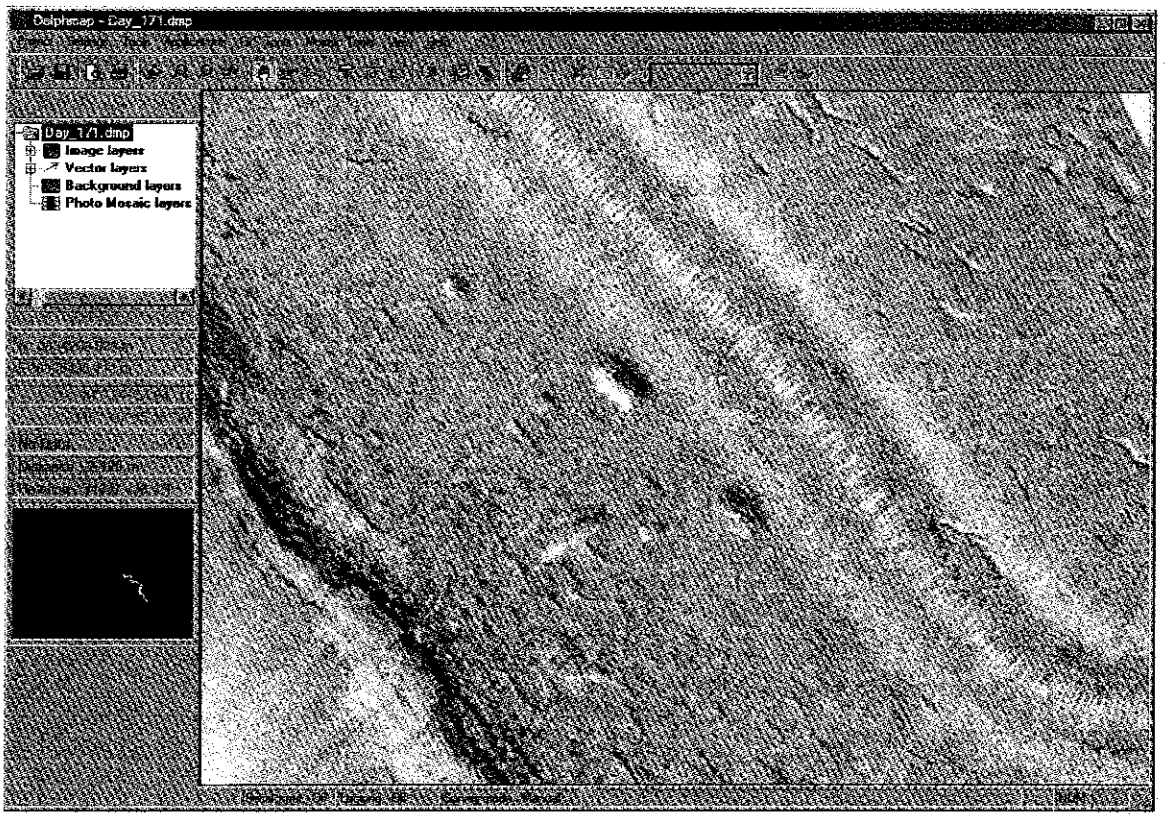
Shallow water fish habitat in Lake Coeur d'Alene and its major tributaries is extensive and varies substantially with various lake surface elevations. Physical description of this habitat will be provided by the combination of depth, slope and substrate texture. The physical habitat characteristics of the shallow water habitat will be independently combined (outside this task) with information on preferred habitat characteristics of major species to identify locations and amounts of habitat available at various lake surface level elevations. This information will support an analysis of potential changes in operating conditions that would change lake levels at various times during the year to address water quality and fish habitat concerns.

General bathymetry data for the Spokane River and the entire lake basin including the lower mainstem channels of the St. Joe and CDA Rivers will be employed to develop a computational model for analysis of flows through and out of Lake Coeur d'Alene. Bathymetry data is necessary to provide the basic information for construction of the model. The computational model will provide an analysis of lake surface elevations that can be achieved under various inflow and discharge conditions that may be considered as operating alternatives for the Spokane River Project.

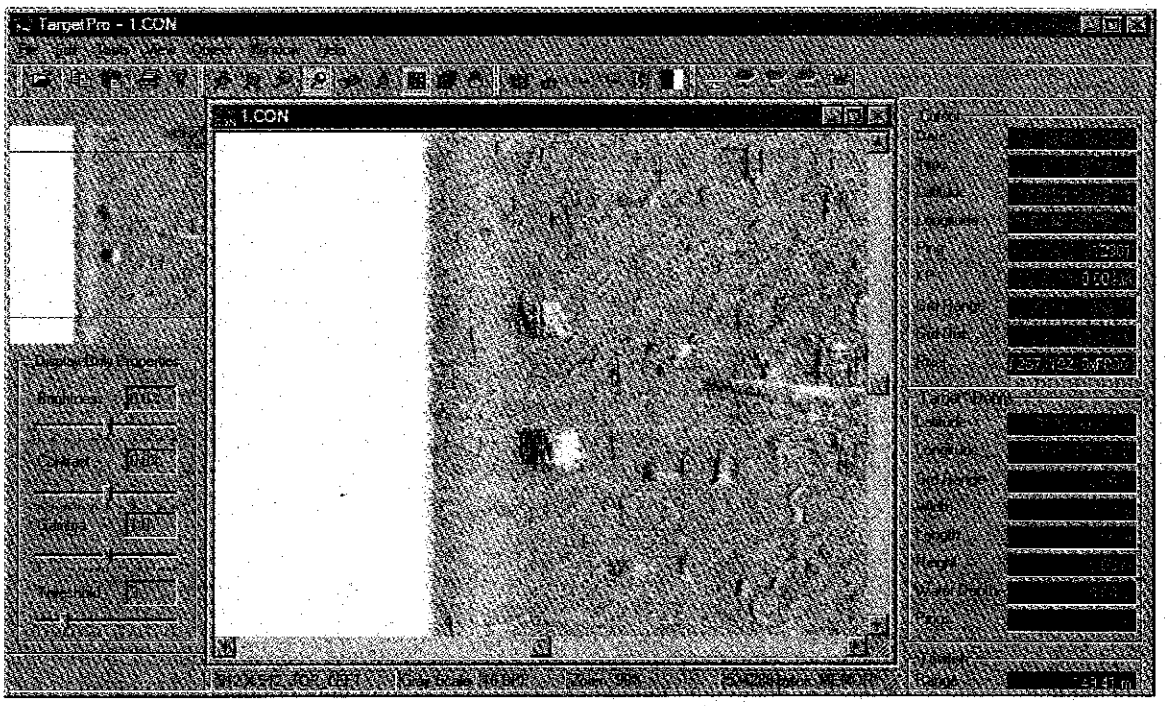
Budget

Bathymetry Data Collection, Analysis, Mapping	
Total Estimated Cost	$200,000

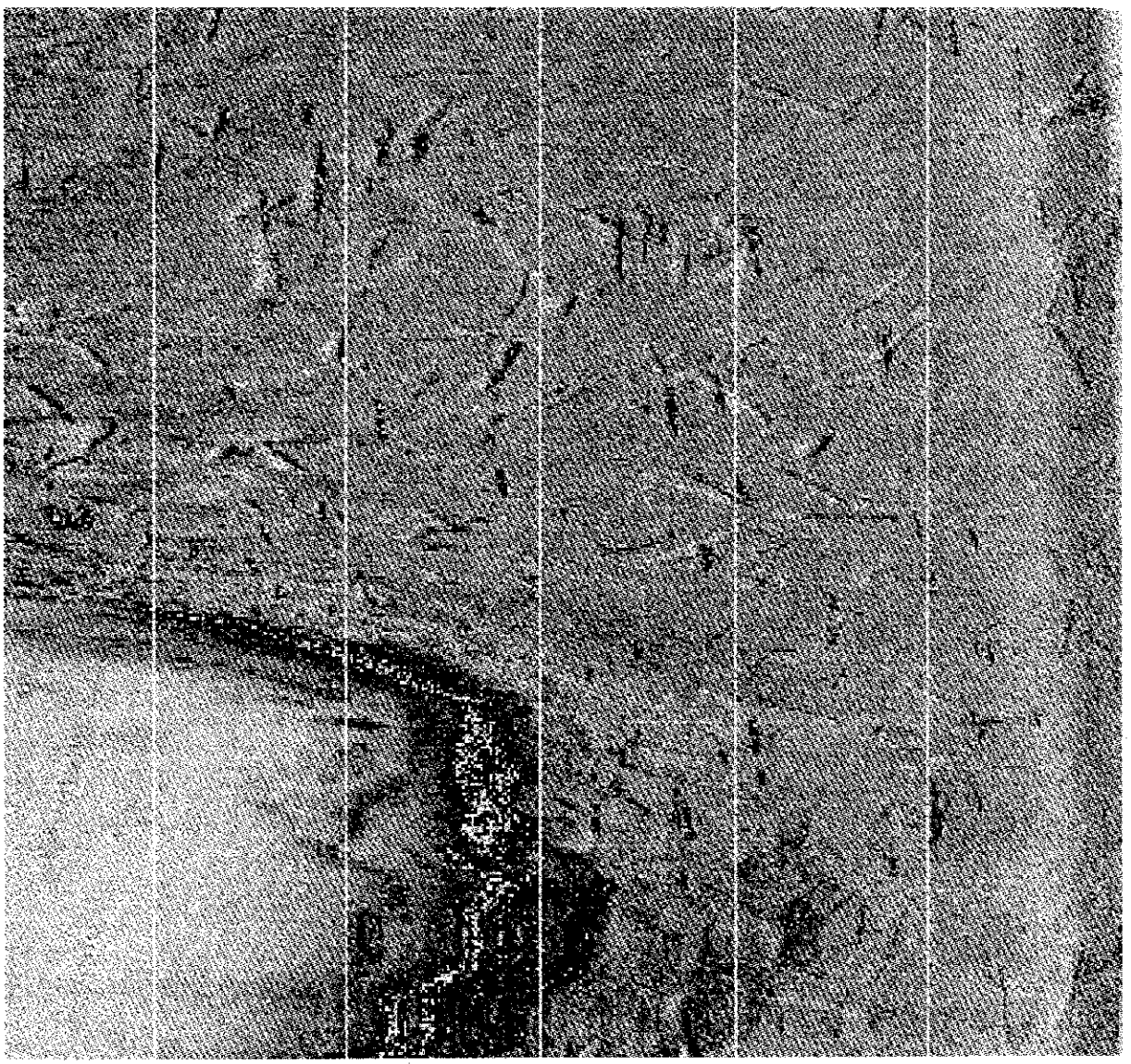
Attachment 2. Images of Raw Sonar Data



Snapshot of mosaic image



Snapshot of raw sidescan sonar data



Raw sonogram showing submerged timber

Attachment 3. Description of Woody Debris Analysis

Avista Corporation provided a GIS layer of classified lake bed types. The classifications are based on the acoustic response of lake bed sediments and features to sonar. The classifications and definitions are listed in Table 3.1.

Avista Corporation noted that the woody debris classification was based on two criteria, 1) The texture of the substrate, and 2) the presence of significant scattered surface debris. In keeping with a 'habitat' description we decided to account for both features rather than simply saying fine-grained substrate. For most cases at Coeur d'Alene, the logs or woody debris seem to occur in areas of historical or active log rafting areas, or areas where anthropogenic activity occurred. The substrate acoustic response was indicative of fine sediments in these areas" (personal communication, Bruce Howard, Avista Corporation, October 4, 2004). Because the classifications were provided in a polygon GIS layer, it was possible to calculate the area described as woody debris. There are 65.5 surface acres of woody debris in the southern portion of the lake and over 65% of the total area is located in Browns Bay (Table 3.2.).

Table 3.1. Avista Corporation lake bed classifications based on side-scan sonar

Classification	Description
Vegetation/ shoreline	Shoreface vegetation. Interferes with substrate sonar response. For Coeur d'Alene, these areas are predominately fine-grained.
Coarse	Coarse-grained sands, gravels, and cobbles. Some steep-sloped faces, based on surrounding conditions, that are likely to consist of coarse-grained sediments.
Medium	Fine- to medium-grained sands.
Fines	Muds, silts, and fine-grained sand.
Rock	Primarily rock outcrops, boulders, rock-strewn areas, and engineered slopes, including rip-rap.
Steep slopes	Steep slopes causing specular acoustic responses. Substrate not identifiable using sonar. Substrate is likely to be similar to surrounding areas.
Vegetation/ offshore	Refracted acoustic returns from vegetated areas in the outer beams of the sonar. Associated with fine sediments in deeper water.
Woody debris	High concentrations of scattered wood debris such as logs, pilings, detritus materials. For Coeur d'Alene, these areas are predominately fine-grained.
Unclassified acoustic signatures	Indistinguishable among coarse substrate, vegetation, steep slope categories, and substrates comprising coarse/medium sediments with occasional vegetation. The acoustic signature of these classes is sometimes very similar and difficult to distinguish.

Table 3.2. Area of woody debris classification

Area	Classification	Acre
Rockford Bay	Woody debris	1.71
North of Cottonwood Bay (north of Browns)	Woody debris	0.71
Brown's Bay	Woody debris	44.13
Cleland Bay	Woody debris	5.25
Fullers Bay (south of Cleland)	Woody debris	4.25
Northwest shore across from Fuller's Bay	Woody debris	0.91
South of Conkling Park (south of Browns)	Woody debris	8.54
Total		**65.5**

All areas are located south of Harrison except Rockford Bay and north of Cottonwood Bay, which are north of Harrison.

The calculated area of woody debris is conservative because the side-scan sonar incorporates only the area from the shoreline extending approximately 790 feet into the lake. Sunken lumber outside this area is not captured by the analysis. Falter (2004) noted in his report that because of the neutral buoyancy of the logs, there is a net migration over time down side slopes of the lake (Falter, 2004, Appendix A). In other words, the high concentrations of logs most likely exist in deeper water further away from shore, outside the range of the Avista sonar study.